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ABSTRACT

The special cultural and socioeconomic circumstances that make traditional approaches to teaching ineffective and unsatisfactory for the underprepared student in higher education institutions are examined and special techniques for assisting these students are presented. Some innovative approaches and techniques that have proven effective in improving the learning of these students, and the learning theory upon which they are based, are summarized, with particular emphasis on individualized approaches that can accommodate the broad diversity of learning styles and needs found among students. An individualized instructional program used in teaching social sciences at Cuyahoga Community College is described. The program has resulted in improved learning and the ability of the program to raise students' levels of cognitive operation in processing content has been demonstrated. The model and techniques presented allow modification for implementation in a variety of higher educational institutions and require less expense for implementation and maintenance than many other similar programs. (SC)

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EDUCATIONAL CONSULTING STUDY

WORKING PAPERS ON PROFESSIONAL
DEVELOPMENT IN TEACHING

SPECIAL TECHNIQUES FOR ASSISTING
THE UNDERPREPARED COLLEGE STUDENT

by L. Mark Ludwig

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SPECIAL TECHNIQUES FOR ASSISTING THE UNDERPREPARED COLLEGE STUDENT

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Number 5
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PREFACE

The Educational Consulting Study (ECS) was organized in September, 1974 to promote professional development in collegiate teaching throughout northeast Ohio. Funded by the Cleveland Foundation, the federal Fund for the Improvement of Postsecondary Education, and the W.K. Kellogg Foundation, ECS works with faculty and administrators who are responsible for or committed to improving the conditions for teaching and for learning at any one of the 23 institutions of postsecondary education in the region.

One of the services ECS provides is informational in nature. People trying to improve instruction so that more students learn more have great "needs to know". What works? What doesn't? How do my efforts fit in the general context of educational mission? What resources can I draw on for assistance? Who else in the profession is doing this sort of thing -- successfully?

This series of papers is one way ECS can respond to those informational needs. It is a partial response at best; hopefully, it goes some distance in the right direction.

In this paper Mark Ludwig briefly describes the "New Students" in higher education institutions and the special circumstances, both cultural and socioeconomic, which tend to make traditional approaches to teaching ineffective and unsatisfactory for them. He then summarizes some innovative approaches and techniques (and the learning theory upon which they are based) that have proven effective in improving the learning of these students. He concentrates on individualized approaches, those which accommodate the broad diversity of learning styles and needs found among students. Finally, he details an individualized instructional program he has implemented in the social sciences at Cuyahoga Community College. The results of his program have been quite promising -- not only in terms of improved learning, but also in the demonstrated ability of the approach to raise students' levels of cognitive operation in processing content.

The model and techniques he employs are especially useful because they allow modification for implementation in a variety of higher educational institutions. Additionally, his approach requires comparatively less expense for implementation and maintenance than many other similar programs.

LCB

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The influx of large numbers of "New Students"¹ into institutions of Higher Education continues to pose severe instructional problems for educators. While most of these "non-traditional" students have generally earned entry into colleges by meeting standard matriculation requirements, many of them have arrived with poor preparation and a lack of basic academic skills. The "Open Door" concept, the active recruitment of minorities, and a greater emphasis on technical and occupational programs (especially at community colleges) have attracted many students classified as "disadvantaged" or "culturally-deprived" to institutions of Higher Education. In addition to these atypical students are those whose preparation and academic backgrounds are good to excellent and for whom college is the culmination of personal and family aspirations. Meeting such a diversity of learning needs and styles poses severe questions for college educators, most of whom are not expert in treating the learning deficiencies or the special requirements of those who represent a new population for Higher Education.

The nation's community colleges seem to attract a disproportionate share of these New Students, and they, for the most part, have begun to implement programs to cater to students with serious learning problems. While most colleges have attempted to provide for remediation of academic skills through special programs, many have offered them in distinct facilities or structures which too frequently have required at least part-time separation of low-ability students from the general college mainstream. Some college remedial programs permit the poorly-prepared students to enroll in general track courses, in which these

students typically find themselves at a disadvantage, often ensuring that they will drop out or receive poor grades. It seems desirable--although not mandatory--to establish programs which meet the learning deficiencies of non-traditional students within the context of general college classes and which do not require the onus of separation or labelling as "remedial."²

New Students apparently fall into two major categories. The largest number are from "working class" families, typically white, generally of an ethnic minority, and **are** the first of the family to attend college. They most often have little tradition of academic background with which to identify (either from family or peer group) and have typically had little success in previous schooling, having earned mostly Cs. Many **are** returning to school after an **absence** of several years during which they have found themselves in dead-end jobs or subject to frequent lay-offs. The other group of New Students are made up of the "disadvantaged" members of minority groups, most typically Blacks whose environments, both family and neighborhood, have offered little stimulation or academic tradition. They, too, are generally the first of the family to have attended college, their schooling has frequently been less satisfactory than that of the working-class group, and they are faced with the additional problems resulting from their use of "non-standard" English learned in ghetto environments. In effect, many of these learners must essentially master a new language to fully benefit from Higher Education.

While large numbers of New Students enroll in college with excellent records, proper academic backgrounds, high motivation, and good study skills, many appear at the Open Door with poor reading and writing skills and abilities, no prescribed study habits, defeatist attitudes, and a

long record of failure in previous schooling. Quite naturally, New Students fall at all points on the spectrum for which the earlier descriptions serve as polar opposites. However, one consistent element found among all New Students is that the great majority reside in the lower socio-economic strata of society.

New instructional strategies will have to be devised to meet the learning requirements of this new group of learners in Higher Education. Some have suggested a general model of "individualizing instruction," a useful innovation which describes and provides for teaching activities to be designed in terms of each learner's individual needs. Jerome Bruner has identified three elements among low-ability students which bear relevance for providing optimal instructional activities for New Students who exhibit academic deficiencies. While his suggestions are specifically geared for pre-school children from lower socioeconomic groups, there is reason to believe that these program elements can easily be adapted for New Students in colleges and universities. Because these learners are typically passive in their academic settings, Bruner suggests that students become active in their own learning; because they may require longer to learn than most average students, they ought to be offered sufficient time to achieve subject mastery; and because of a lack of reinforcement of learning behaviors and academic curiosity, the instructional program should be designed with built-in successes at planned and predictable stages.³ These elements are found in most programs which are described as "individualized instruction."

One particular version of individualizing instruction which meets these requirements is "learning for mastery," a strategy described by

Benjamin Bloom in adapting John B. Carroll's "Model of School Learning" for practical classroom use. Carroll had proposed that the degree of school learning was a function of the ratio between the time a student needed to learn a task and the time available for learning that task. Carroll further divided the two elements into specific categories: "time needed" included "perseverance" and "aptitude," while "time available" was divided into "quality of instruction," "time available," and "ability to understand instruction." Bloom's proposal included the idea that perhaps 95% of all learners could achieve subject matter mastery if sufficient time was allowed for the student to learn the task to a level of "mastery," defined as perhaps 90% correct on any evaluation. A large body of research has demonstrated that the basic concept of "learning for mastery" can be supported, but other indexes reveal that not all students have achieved "equality" with all others in spite of having learned the subject or task to mastery.⁴

Some versions of individualized instruction have put the concept of learning for mastery to work in a systematic strategy for classroom instruction. Audio-tutorial methods have used tapes, slides, TV, and other technological devices to present material individually to students. In individually-prescribed-instruction (IPI), students are pre-tested for levels of competence at the outset of a unit of material and then instruction or learning activities are "prescribed" based on the "diagnosis," much as medicine is prescribed for physical ailments. Both of these methods require equipment and lengthy preparation before the system can be instituted, and the cost often prevents their introduction as procedures for assisting low-ability learners.

One method of "individually-monitored-instruction" has been used in over 2000 courses nationally and internationally, and has demonstrated success in improving learning in almost all fields and disciplines in which it has been attempted. Fred Keller and his associates at the University of Brasilia designed procedures they called the "Personalized System of Instruction" or "PSI" in 1963. The design attempted to make use of most learning research in a systematic program for the improvement of instruction. The elements of the "Keller Plan" included:

1. Reinforcement learning theory, in which the desired behaviors of students are rewarded and the undesirable ones are not punished but are allowed to become extinct;
2. Self-pacing of each student to allow for differential rates of learning (following Bloom's and Carroll's mastery construct);
3. Emphasis on printed material (i.e., textbooks, study guides, additional readings) and few if any lectures;
4. Requirements of the small division of the task (unit, module, or chapter) are stated in terms of operational student behaviors and are provided to each student;
5. Formative evaluation to mastery at the conclusion of each course division with required re-takes until the mastery criterion (typically 90%) has been achieved;
6. Immediate feedback on formative evaluations by student peer proctors. 5

The literature consistently shows that PSI is a viable and effective method of instruction, as research has validated its value in the improvement of student achievement. James A. Kulik has gathered over

300 studies on the effectiveness of PSI as an instructional strategy when compared to a lecture/discussion method. He showed that in 39 of the studies which met methodological standards, PSI had demonstrated higher achievement results in 38 of them, with significant gains in 35 of the cases. Also, students learning under PSI tended to retain learned material longer, they transferred learned material better when the second course of the sequence was taught under traditional methods, and they reported that they approved of the method and would take more courses under PSI if offered the opportunity.⁶

Certain benefits for students exhibiting the learning difficulties described earlier are derived from such approaches as personalized instruction. There is of course improved performance as revealed in higher achievement; students who have never earned a high grade find that they too are eligible to work for either A or B. Data reveals that under mastery conditions, course achievement is less dependent upon entering skills or abilities; correlations between aptitude and achievement are typically lower under mastery learning than under other instructional programs. The self-pacing of individualized procedures allows the **slowest** learners the time they require to learn a task or subject well without being forced to move on with the class as a whole, and they will not delay a class while they work at their own paces to a desired level of competence. The systematic structure of personalized instruction in particular allows for necessary remedial assistance in a regular and prescribed manner, and monitoring of progress is possible at any given interval in the course. But perhaps the major benefit of individualizing instruction is that it typically emphasizes learning outcomes of students rather than any teacher

activities or behaviors. Thus it directs the instructor's attention away from what he or she will be doing to what the student must show or demonstrate at the end of particular stages of instruction.

Yet individualizing instruction, even though the successes of PSI are well-documented, will not by itself solve all of the problems or deficiencies in student preparation, background, and learning behaviors. In spite of individual attention and a learning environment structured for maximum student learning, some disadvantages occur because the specific learning behaviors of low ability students have not been programmed into the strategy. The design of the PSI format reveals an emphasis on middle-class values, motivation, and rewards; low ability and low socioeconomic level students may not always come equipped with these values. Many students are also quite traditional in their expectations of what a college classroom is like than are those who are familiar with and comfortable with the situation. These students often insist on lectures and a tight schedule listing specific assignments; they often prefer imposed goals to being on their own; they frequently have little confidence in their own abilities to understand written material and feel more comfortable hearing it from an "expert." As it has been shown that disadvantaged persons typically rely on the institutions of society--including teachers and educational systems--to assist them in coping with life situations, they often demand services as a natural right emanating from the payment of tuition.

In addition to a lack of confidence in themselves, low ability college students are apparently given to blame of external forces for their lack of success. Taking responsibility for one's own failure--or success--

is related to Rotter's hypothesis of the "locus of control." Among persons described as "externals" in their locus of control, chance or luck are generally seen as reasons behind success; other people or bad breaks are often cited as causes of failure. In a self-paced program, it must be assumed that persons will work somewhat consistently toward the goal; but when the goal is elusive and not specified in terms of material rewards, many students cannot seem to find a purpose to work toward it. Thus, they often fall behind and give up, or perhaps they take the approach that they can make it all up in a few days. They generally do not remember the fact that they have had to work on a given unit for several days before it was completed; rather, they remember only the day that it was passed--and they completed the unit in one day. And they can do the rest in only a few days. For many the problem is one of merely attempting to pass a formative mastery quiz; it becomes the only goal--passing. Learning the material for later use (as on a "review test" or a final exam) is a secondary consideration. The emphasis on today's success often blinds many to the realities of tomorrow's responsibilities.

Perhaps the most disastrous problem facing students of low ability in an individualized program is the strong emphasis on reading, especially since so many demonstrate a serious lack of reading ability. Even textbooks written at the tenth-grade level seem overwhelming when the student reads at a fourth-grade level. The abstractions contained in the chapters are frightening if the student thinks only in concrete terms. If the examples are remote from a student's experience--and many textbook examples refer either to exotic places or are phrased in terms of the

author's experience--then the concept can become confusing. If there is no explanation of a concept in terms that enables the student some meaningful identification, that concept will probably not become internalized, but only memorized. And translation of concepts into one's own experience is a skill not generally found among low-ability learners.

Additional elements must be included in an individualized program to meet the specific learning difficulties of low ability college students. The special problems posed by these students should dictate the type of program and the necessary remedial elements which must be applied. It is necessary at the outset to describe the specific learning problems which will potentially be encountered when working with low ability college students.

CULTURE AND COGNITION

Research literature is consistent in identifying cultural influences and family orientation as exerting major impact on cognitive styles in learning. It would appear that the motivation, attitude, and perceived importance of schooling which are fostered and engendered by the family in the learner at early ages may be among the most significant elements in the creation of goals and aspirations which lead to success in the environment of formal education. Studies of children from families identified as "working class" or families of poverty report styles of verbal interaction among parents and children which are remarkably distinct from the types of interaction found in "middle-class" families.⁷

Middle-class mothers typically spend more time talking with and explaining things to their children than do working-class mothers. The

conversations are generally responses to children's questions and concerns, from requests for meanings to explanations of phenomena or events. The child's questions such as "Why?" are typically answered or at least responded to. Such an attitude on the parent's part has the effect of reinforcing the questioning and curious attitude of the child and of informing her or him that asking questions is a worthwhile activity. On the other hand, children raised in lower socioeconomic families will frequently find that their concerns and questions receive little or no response, that their curiosity is often dampened, that their concerns are ignored, and that their mothers or fathers are frequently "too busy" or occupied with other matters to respond. This lack of reinforcing of questioning usually leads to a squelching of natural curiosity and fosters attitudes that knowing and learning are unimportant.

Other specific learning problems of students in college may be inferred from research on "cultural deprivation" and on "problem solving." Riessman, Bereiter and Engelmann, and others have identified specific characteristics of "cultural deprivation" which have revealed causes of a lack of success in schooling and other academic pursuits.⁸ These learners are typically oriented toward "concrete" matters and have great difficulty dealing with the abstractions so much a part of academic activities, they are passive rather than active in their learning, and show little confidence in their abilities to work by themselves. They learn better under visual stimulation rather than aural presentation, and are inclined toward results and "right answers" rather than the processes of obtaining those answers. They typically employ "one-shot thinking" in testing situations, generally taking the approach that if the answer is

not immediately at hand, then it is unavailable. They usually demonstrate a lack of reasoning ability during evaluations, seeing little need for it as a means of solving problems; indeed, reasoning has not been generally emphasized either at home or by their peers, and quite frequently at school as well. According to Rotter's speculations, learners coming from low socioeconomic groups more typically exhibit an "external locus of control," feeling that their ability to manipulate the environmental circumstances in which they find themselves is limited if it is possible at all. Persons from backgrounds of cultural deprivation show strong reliance on institutions; indeed, their need for schools and teachers is revealed in that they sit passively awaiting a magical process of instruction to teach them what they need to know.

The students with learning problems, then, appear to have poor reading and writing skills, they tend to have passed through poor schools, their environments have not been conducive to academic success, and their family orientations have not fostered a need for rewards from knowing and learning. These characteristics are generally revealed in low measured aptitudes. If the students have taken the traditional measures of academic potential at all (ACT or SAT), they show scores below average. Indeed, only 20% of the students at Cuyahoga Community College have reported these scores on their applications or records. In large Social Science classes, only 10% were found to have taken either test, and their mean score on the SCAT-II verbal aptitude test placed the groups at the 17th percentile nationally for college freshmen, equivalent to an SAT score of 320. Reading levels of students at CCC-Metro Campus are often below a sixth-grade level, and occasionally below third grade.

While many remedial programs in colleges attempt to improve reading and writing skills as basic preparation for concentrated college work, a large percentage of the programs do not work specifically to improve "reasoning" skills or "problem-solving processes." Benjamin Bloom and Lois Broder in 1950 compiled data after testing students at the University of Chicago who exhibited difficulties in learning. In their unique style of identifying "problem-solving processes," they asked students to "think aloud" while responding to specific questions on tests which involved problem solving. The researchers found rather consistent patterns of response among both "good" or "successful" problem solvers and those who were considered "poor" at finding the correct solutions. Among the difficulties exhibited by the poor problem solvers, these categories were identified by Bloom and Broder:

1. Understanding the nature of the problem -- most of those with difficulties were not able to take an objective view of the problem and frequently did not work on the problem as presented. They showed a definite lack of ability to begin an attack on the problem, and vacillated on what to do.
2. Understanding the ideas contained in the problem -- they were generally unable to realize the implications of the problem and could not bring relevant information to bear when searching for a solution to the problem.
3. General approach to the solution of problems -- most poor problem solvers gave the problem itself little thought; they were careless and not systematic in their approach to seeking answers. They showed a decided lack of ability to follow through on a process of reasoning,

and they often did not see a problem as necessarily susceptible to any solution.

4. Attitude toward the solution of problems -- most poor problem solvers had negative attitudes toward the process of reasoning, and did not see it as important in locating proper solutions. They showed little confidence in their own abilities to reason or locate answers, and they frequently introduced personal considerations into the problem, a process which tended to confuse them in the solution of the problem.⁹

These findings were more often than not supported by the research of Bereiter and Engelmann with respect to the cognitive processes of disadvantaged pre-schoolers. When confronted with problems new in their experience, poor problem solvers typically employ "one-shot" thinking: that is, they seem to feel that if an answer is not immediately available, it is unattainable. Thus they guess at what they consider a likely answer without further attempt to locate a proper response with reasoning or systematic processing. Indeed, Bereiter and Engelmann found that many children felt that it was rather important to offer an answer immediately rather than delay for a response which could be obtained through a process of reasoning.¹⁰

In working with some poor problem solvers at CCC, some additional characteristics have become apparent. Students frequently memorize bodies of material, facts, definitions, details, and data, but are often unable to use the material in another context. They are often blocked from correct responses by even small changes in wording or with the use of examples of the information. Also, in many situations, students are confused if test items contain the words of the memorized information in an incorrect response. Their style of association reveals to them

that they saw these words together in studying and that they therefore must be related in the answer. The lack of a systematic method of attack on the problem defeats them at the outset.

A third related problem isolated among these students has been revealed in tutoring. Many students show impatience with the process by which an answer may be obtained; they are "answer-oriented," in that they are generally concerned with what the correct response should have been and not why it was correct. Once the proper response has been identified, they lose interest in the problem itself and in any explanation of the process through which the answer was obtained. Another problem which has not been identified in most of the literature deals with the structure of the problem as presented. Often it has been found that students receive no clues to correct answers from the context of the question itself. A stem of a test item which requires completion with a multiple-choice response is seen as meaningless for a clue to an answer. For this reason, more success has been derived when test items are presented with stems as questions requiring an answer, rather than as incomplete sentences requiring a proper choice for completion.

Bloom and Broder have identified the characteristics of successful problem solvers, and these reveal vast differences from the unsuccessful ones. They reported that "good" problem solvers pursue the problem actively with a systematic attack, often varying their approaches to the nature of the problem itself. They employed a sequential analysis of the problem and its components, and pursued a careful process through to a solution. They drew on available information and attempted to translate the ideas contained in the problem into concepts with which they were familiar. Their second stage of the work of Bloom and Broder was

to instruct poor problem solvers in the techniques of the successful ones, a process in which they reported many successes.

Arthur Whimbey has attempted to apply some of the processes employed by Bloom and Broder to improve the cognitive functioning of students who have exhibited learning difficulties.¹¹ His process of "Cognitive Therapy" requires students to "think aloud" while solving problems, either to an instructor or to a student with good problem solving practices ("the Buddy System"). The instructor or proctor calls attention to suggested procedures for locating correct solutions. The subjects are presented with "protocols" (frequently audio tapes of successful problem solvers) and are asked to make comparisons and/or lists of differences between their approaches and those of the successful ones. Whimbey reports much success and frequently some complete reversals for some students who had previously been unsuccessful in college.

The most significant question to be faced with respect to problem solving processes, cognitive functioning, and the improvement of learning patterns is to ask whether or not these specific competencies can be taught to those found to be deficient in them. Research has demonstrated rather conclusively that they can be: Bereiter and Engelmann have shown remarkable success with preschoolers, the Milwaukee Project shows that the gains can be made permanent, and Bloom and Broder have demonstrated that the competencies can be fostered among college students and adults.

Jerome Kagan has insisted that all but those suffering brain-damaged defects can learn and can employ the required basic intellectual functions necessary for success in learning. His list of basic intellectual functions may be considered required competencies for most college-level

work. Kagan feels that learners are able to:

1. understand and speak a language
2. think symbolically
3. place events in conceptual groups
4. infer complex relationships among events
5. deduce implications
6. analyze the environment into parts and wholes
7. remember large chunks of past experience.¹²

It is possible to associate these competencies with the initial five levels of Bloom's Taxonomy of cognitive processes, with only these level of "Evaluation" not identified.¹³ The research on the ability of low aptitude students to work at levels of the Taxonomy above "Application" has not been fully demonstrated. If these processes are to become part of a student's arsenal of cognitive equipment, they will have to be taught. They do, however, show up in successful college students and are generally expected by college instructors as basic intellectual equipment of their students. Those students who do not possess these competencies have unquestionably been working at a disadvantage in their college studies. They may have been shortchanged in their educational backgrounds, but total blame cannot be placed on elementary and secondary schools. In most middle-class homes and in those which have fostered an interest in academic success or where the goal is upward mobility, learners have gained these competencies in subtle and diverse ways. Public school teachers, traditionally oriented toward the expectation that these competencies have been taught at home, assume that students have them or they don't; they are typically not prepared to teach them along

with their subject matter.

An effort to raise the cognitive processing levels of low ability students was part of a research study at Cuyahoga Community College.¹⁴ In a PSI course in the "Introduction to Social Science" sequence, control subjects were asked to master required information and were tested with objective items which were not specifically oriented toward higher-level understandings. The experimental group was required to demonstrate mastery on unit evaluations at the Knowledge level as well as at higher levels--Comprehension, Application, and Analysis. In correlations between aptitude and achievement on a midterm examination, the experimental group showed virtually no correlation ($r=.03$) while the control group was moderately significant ($r=.43$). At the Application level, the differences were not significant but favored the experimental group ($r=.18$, $r=.27$). At the Analysis level, the difference had disappeared and showed a significant jump from Application for the experimental group. In the short period of this experiment (seven units to a midterm with the slowest student using ten weeks), significant differences were obtained for the experimental group subjects in their cognitive processing at the second level of Bloom's Taxonomy. Bloom has written that the operations required at this Comprehension level were a key to problem solving processes.¹⁵ It would also appear that the slight gains shown at the Application level may have been susceptible to more significant change if the time available had been more in keeping with the typical slow process of cognitive development. It does become apparent that some effect on learning style and ability to work at higher cognitive levels is possible within a systematic approach to the improvement of learning deficiencies. It becomes necessary to identify the students with difficulties in order

to deal effectively with their difficulties.

A program of personalized instruction based on the Keller model has been established at CCC, but essential modifications have had to be made.¹⁶ These changes have been effected to accommodate large-group (over 150) instruction, the lack of sufficient trained proctors (only four or five may be paid), the lack of upper-division students who may serve as proctors (universities can often enlist subject majors or graduate assistants as proctors), and the range of learning abilities and styles which must be confronted. PSI apparently by itself cannot meet the needs of the extreme learning difficulties of many students, since their problems fall outside the cultural context of personalized instruction. But the process of individualizing instruction offers benefits to most low aptitude students, because its structure permits close monitoring of student learning.

The basic procedure of PSI at CCC follows the Keller model closely through the initial stage. Lectures have been offered in some terms and dropped in others; there is no evidence that lectures have offered any additional benefits in terms of achievement to students. Lectures do, however, provide a basic structure to allow students to establish a course schedule: they know "where the class is" at precise moments of the term. Such a schedule has had some effect on drop-outs and procrastination in some sections. "Self-pacing," so much a part of personalized instruction, is generally offered as a "reward" for successful completion of the earliest units, but in effect becomes a reality for those far behind later in the term. Students are frequently required to make "appointments" to re-take quizzes which have not been mastered so that they feel responsible for specific assignments. Some of the slowest

have been required to complete specific written assignments before they have been offered further quizzes or tutoring.

The general procedure has been to offer the scheduled quiz (or any prior ones) to the entire class on a specific date in a large class session. Those eligible complete their form of the quiz and have it scored by a proctor. The feedback at these sessions is minimal since there may be over 100 students attempting the quiz with only four or five proctors (some of them volunteers from other classes or from previous terms) serving as "evaluators." Typically, over 60% meet the mastery criterion on their initial attempt; they are given the next unit study guide and are excused. Those who do not achieve mastery are provided with a "worksheet" (a series of written exercises which require completion--in whole or in part) and asked to return another time for another attempt. Some students barely miss the mastery criterion and may receive immediate tutoring by the instructor, and they will be offered the quiz a second time during the large-group session. The instructor also acts as an arbiter when responses are challenged by students; oral quizzing and on-the-spot questions frequently reveal mastery by some students; it has only been misunderstanding of a question or some slight error of judgment which has caused the student to miss more items than the mastery criterion has allowed. Such problems are quickly dispatched and students are credited with mastery.

Those who must attempt the quiz a second time should have completed the worksheet and brought it with them for their second attempt. The emphasis of the worksheet is on subject matter, especially correct definitions, useful examples, or suggested applications of subject matter.

The workbook style of the worksheet is consistent with the requirement that some physical activity on the part of the students come before additional trials at a particular quiz; It meets Bruner's suggestion that students actively participate in their own learning. It was also found that students who did nothing specific between attempts typically scored exactly the same as on their previous attempt. The second trial at the quiz may be accomplished during any large-group quizzing session or during specific make-up hours in a testing facility in the Behavioral Sciences department. Data indicates that approximately 25% correctly handle the second attempt, leaving only between 10 and 15% of the class who exhibit greater difficulties with the unit evaluation. Many of the problems of those who do not achieve mastery on the second attempt have been found to be related to "learning deficiencies."

A student who has not achieved mastery on the second attempt is generally expected to have individual tutoring, either from the Professional Assistant or the instructor, before a third attempt may be made. This tutoring takes place in the testing facility and concentrates on "understandings" required to correctly answer the quiz items. The earlier quizzes are discussed, as are the worksheets, and the student is asked to respond to oral questions in an effort to draw him or her away from merely "answers" and into concepts and processes. It has been determined that very few will ever need this activity on a regular basis, and only those who normally would have passed on their first or second attempt but who had specific problems on the particular unit will have to be accommodated at this stage.

There are some who require a fourth attempt on particular quizzes.

Data indicates that there is a consistent group which must attempt each quiz almost four times, with only a very few who must make this effort only occasionally. The ones who have consistently needed four attempts are prime candidates for "cognitive therapy." With such persons, the work is individual with the instructor. The student is asked to read quiz items aloud, attempt to explain or translate what the question is asking, and to make a choice from the multiple-choice selections. Each choice must also be read aloud, and the student is asked to comment on the possibility of the choice meeting the question's **expectations**. Students are asked to state whether or not the choice is a potentially correct answer, whether or not the choice is either true or false on its face, whether or not the choice falls within the context of the question, and so forth. The student is required to reserve judgment on his or her particular choice for the answer until all responses have been evaluated for correctness before a determination of the answer will be asked for. When a particular response has been chosen as the "answer," the student is asked to defend it with reasons for the selection. The instructor will then respond to the student's choice, stating reasons for the correct answer and the logic behind the choice. The feedback is immediate for each quiz item, occasionally even for each of the choices in the item, with particular reference to the objective from which the item was drawn. Fallacies in the student's logic are pointed out, improper use of information is called to attention, and specific data not used by the student is requested or provided. The entire process of "cognitive therapy" is designed to emphasize the process of choice

selection, and students are encouraged to view the question as a problem to be solved, not as a quiz question to get right or wrong.

Arthur Whimbey and Benjamin Bloom have provided the general description of this process of cognitive therapy, and their use of "protocols" of successful problem solvers adds an important element to the process. This step becomes important when the student is able to view the process of "reasoning" and judgment as worthwhile activities. As was cited earlier, many low ability students do not see the process of problem solving as having much value or relation to the answering of questions. The importance of the process will have to be instilled through coaching and encouragement, even behavior shaping, before the student can fully and effectively profit from the protocols of other more successful students.

It was at first planned that only those who needed a fourth attempt at a particular quiz would be offered the tutoring activities of cognitive therapy, but the consistency with which some students approached this level of need on each formative evaluation emphasized a requirement for early identification. Any student who required a fourth trial at one of the first two mastery quizzes became a candidate for cognitive therapy. When they were given the unit study guide, they were also provided with the unit worksheet, for the workbook format of this type of exercise had been shown to be beneficial for student preparation. The students were also offered the quiz at least once in the regular sequence, probably more for purposes of indicating that they were still part of the class structure and not "special cases." The initial quiz might also be used to indicate if any improvement in the student's cognitive process

could be detected.

Two means of testing the efficacy of cognitive therapy have been devised. Over the years, clear indications have been derived with respect to the consistency of student achievement as related to their learning activities. Correlations have been computed between the total number of "trials to mastery" and achievement scores, both with the mid-term and final exam scores. The correlations have always been rather high and negative, generally above $r = -.50$ and often reaching $r = -.75$,¹⁷ indicating that the more attempts one needs to achieve mastery will mean a lower exam score. It has been expected that the process of cognitive therapy would reduce the correlation in the direction of zero if the process had been effective on the student's cognitive processing. In one term, the correlation had been reduced to $r = -.46$ where the activities of cognitive therapy had been rigidly applied. With strict controls, close observation, and rigid adherence by all staff to high experimental standards, it may be expected that the correlation between trials to mastery and achievement could be reduced even further.

The other experimental factor involves the consistency of the quiz efforts needed by students. Even over two terms in the PSI Social Science Program, some students have averaged more than three attempts on quizzes, and many have never tried less than three times on any one quiz. Following an individual student over the entire course or two-course sequence should indicate any success of the cognitive therapy approach to remediation. At this point, no data is available, but the system has not been rigidly applied for experimental analysis to date.

In discussing the "cultural bias" of standardized IQ tests, Arthur Jensen makes the point that a general intelligence factor (g) is responsible for the largest single source of individual differences. He states that "not difficulty per se, but complexity is the key to g. Items that require some active mental manipulation, some conscious mental transformation, rather than just sensorimotor and short-term memory ability or habitual response, are the most g-loaded items."¹⁸ Jensen of course would view the ability to work with complex material as generally fixed and immutable in individuals.

But the question of whether or not the g-factor can be influenced by instruction has **never** been adequately answered. Evidence presented above would indicate that some instructional activities can work to improve the learner's ability to use more complex cognitive processes. The influence was shown to extend through the "application" level of the cognitive Taxonomy, and certainly was effective at the "comprehension" level. It may be true that the most complex processes--analysis, synthesis, and evaluation--require **some** creative mental activity which may **forever** be beyond the reach of some learners, but the evidence is not clear that these processes cannot be taught as well as the less complex ones. It would appear that efforts ought to be expended to attempt to improve the cognitive functioning of the lowest ability students in colleges and universities. If we do not manage to move their cognitive processing to higher levels, but continue to merely "meet them where they are," we may have to consign large numbers of our clientele to mere rote learning, and in effect lower our educational goals to the level at which these students can function.

SUMMARY

New Students in Higher Education cover a spectrum of ability, preparation, academic background, and motivation. However, among this group are many who exhibit serious difficulties with learning and for whom Higher Education may be one more source of failure. The learning problems which are characteristic of many New Students are apparently the result of many factors, including poor schools and inadequate academic preparation. Perhaps the most serious difficulty is brought about by the culture of the family and the environment in which these students were raised; socioeconomic status has been shown to be a strong influence on cognitive style and learning throughout an individual's schooling.

Individualizing instruction has demonstrated effectiveness in dealing with the great diversity of abilities found in institutions enrolling large numbers of New Students. The "Personalized System of Instruction" as only one method of individualized learning has been shown to be effective in improving achievement and in providing a system for meeting diversity in a classroom. Within the context of mastery learning and other individualized models are found the structure to meet the most serious learning problems of students without creating separate facilities or programs to meet the deficiencies.

Yet individualizing instruction will not alone accomplish the task of assisting all low ability students in Higher Education. The specific characteristics of "disadvantaged" students must be considered in the design of instructional programs to meet the special needs of these learners. One approach--following Bloom and Whimbey--has been called "Cognitive Therapy" and has had reasonable success in improving the

learning styles and abilities of many low aptitude learners.

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